News Releases

Navy Researchers Investigate Phage Therapy to Treat Periodontal Infections

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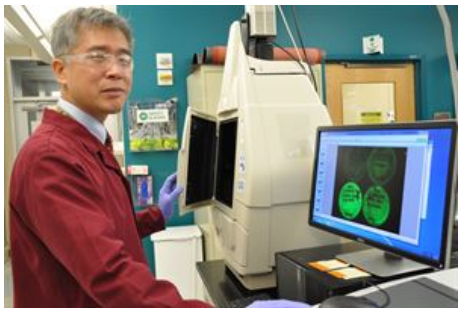

Navy scientist Yoon Hwang, Ph.D., Naval Medical Research Unit San Antonio's Craniofacial Health and Restorative Medicine Directorate, checks the expression of visual markers for the development of genetically modified bacteriophages as a novel therapeutic strategy to treat periodontal infections. **(Photo by NAMRU-SA Public Affairs)**

SAN ANTONIO – Representing mission readiness is critical to the success of the U.S. military and the health of service members is of highest importance. Almost 20 percent of all emergency department visits at a deployed expeditionary medical support facility during Operation Enduring Freedom were the result of dental disease.

In deployed military personnel, 12 percent of dental emergencies can be attributed to gingivitis or periodontitis. Furthermore, the emergence and increasing prevalence of bacterial strains that are resistant to available antibiotics poses a serious threat not only to the military, but to world health.

The Centers for Disease Control and Prevention reported antibiotic resistance causes two million serious infections and 23,000 deaths each year; adding $20 billion in excess direct health care costs, in addition to $35 billion in lost productivity each year.

A critical need exists for the development of novel antimicrobials and alternative strategies for treating bacterial infections. Antimicrobial peptides, or AMPs, and bacteriophages (a virus that targets a bacterium) have shown promise as potential therapeutics.

AMPs are short, positively charged and amphiphilic peptides, that have been reported to provide potent, broad-spectrum activity against microbial infections and have been considered as potential therapeutic sources for future antibiotics.

News Releases

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Navy Researchers Investigate Phage Therapy to Treat Periodontal Infections

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Bacteriophages infect and replicate in their specific host bacterial cells, then release progeny phages to infect more bacteria nearby. The therapeutic use of bacteriophages to treat pathogenic bacterial infections is known as phage therapy and has many potential applications in medicine as well as dentistry.

A unique aim of research within the Craniofacial Health and Restorative Medicine Directorate at Naval Medical Research Unit-San Antonio at Joint Base San Antonio-Fort Sam Houston is to combine the strength of AMPs and phages together by engineering phages to express AMPs during their lytic cycle.

To achieve maximal synergistic effect, a technique to genetically modify phages was developed by inserting an AMP-expressing genetic construct within the phage genome. By replicating within the targeted bacterial cells and expressing AMPs in the infection site, this novel approach can achieve high local concentrations of both AMPs and lytic phages to target nearby bacteria – even with modest initial phage inoculation – and enhance the range of the original phage infection.

Overall, phages and AMPs are less likely to induce bacterial resistance than conventional antibiotics and are considered promising alternatives.

With support from Naval Medical Research Center's Advanced Medical Development Program, ideal candidate AMPs were selected based on their antibacterial activities and safe concentration against human gingival epithelial cells.

Genetic engineering of the phage genome utilizing several recombineering methodologies is currently being conducted. Further testing and development of phage delivery systems are underway to identify new bactericidal treatments for periodontal and wound infections.

Development of genetically engineered phage expressing additional antimicrobial peptides would provide the foundation for rapid, selective and inexpensive treatment methods against periodontal pathogens and help service members maintain a high level of readiness.

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